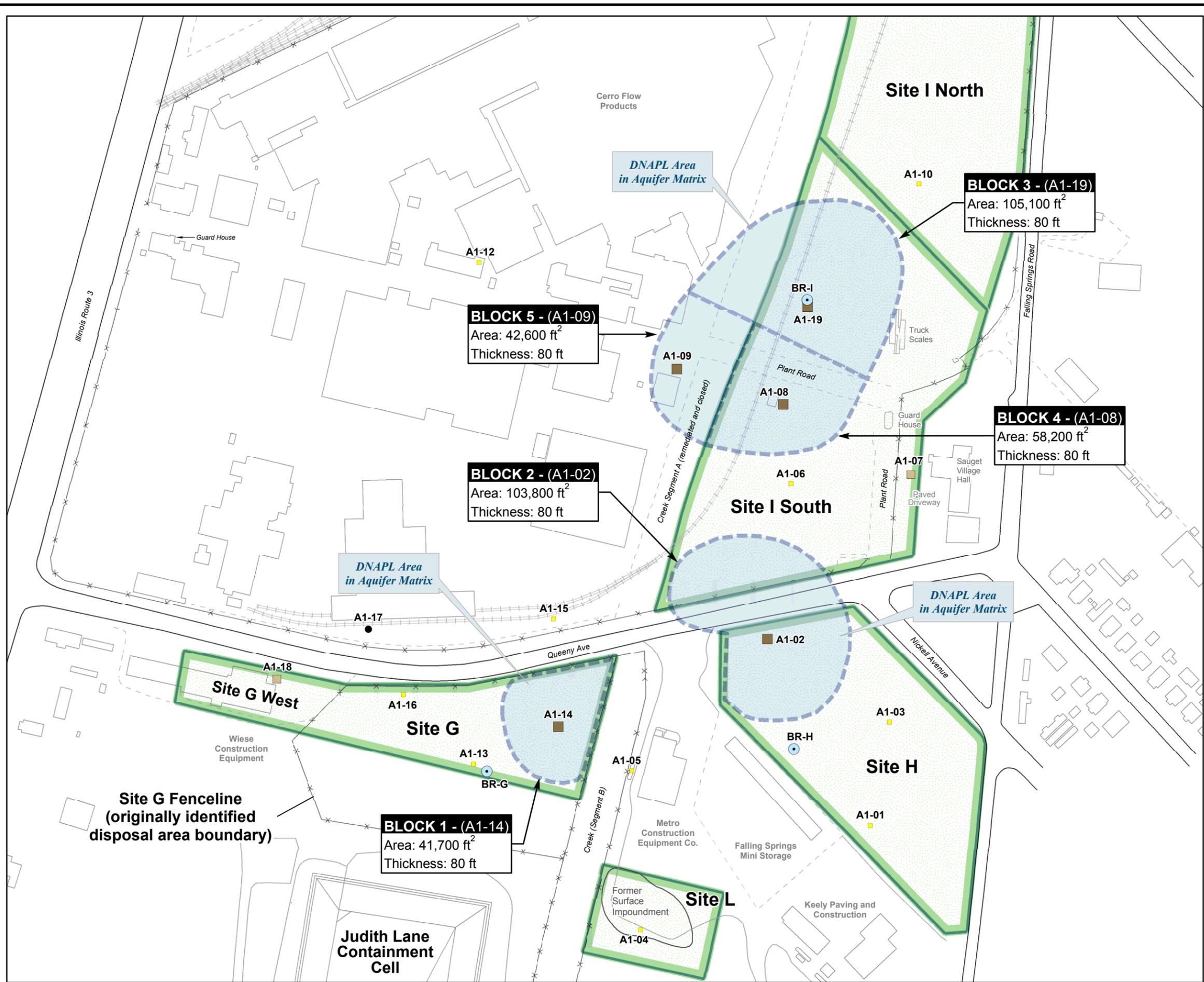


APPENDIX I

Calculation of Source Mass and Ranges of Source Mass Removal for Key COCs in Residual DNAPL Source Areas

Figure I-1: Areas Used for Estimating Source Mass in Residual DNAPL Areas at Sites G, H, I
South, and L

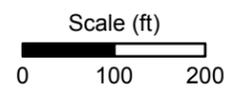
Table I-1: Calculated Mass Ranges and Potential Mass Removal at Residual DNAPL Areas



LEGEND

- Field evidence of NAPL based on visual inspection of cores and/or vial test kit results. Total VOCs \geq 1 mg/kg and/or total SVOCs \geq 1 mg/kg.
- Field evidence of NAPL based on visual inspection of cores and/or vial test kit results. Total VOCs $<$ 1 mg/kg and total SVOCs $<$ 1 mg/kg.
- No field evidence of NAPL based on visual inspection of cores or vial test kit results.
- Areas of waste/affected soil
- Areas of DNAPL residual in the aquifer matrix

Note
Total thickness of MHU and DHU is approximately 80 ft.



AREAS USED FOR ESTIMATING SOURCE MASS IN RESIDUAL DNAPL AREAS AT SITES G, H, AND I SOUTH
Sauget Area 1 Remedial Investigation/Feasibility Study
Sauget and Cahokia, Illinois

GSI Job No.	G -3767	Drawn By:	CDM
Map ID:	001_01	Chk'd By:	JAK
Issued:	25-May-2012	Apr'd:	
Scale:	As Shown	Figure I-1	

Table I-1

Calculated Mass Ranges and Potential Mass Removal from Residual DNAPL Areas

Feasibility Study, Sauget Area 1, Sauget and Cahokia, Illinois

	Calculated Mass in Block 1 (A1-14) (kg)	Calculated Mass in Block 2 (A1-02) (kg)	Calculated Mass in Block 3 (A1-19) (kg)	Calculated Mass in Block 4 (A1-08) (kg)	Calculated Mass in Block 5 (A1-09) (kg)	Total Calculated Mass, Blocks 1 through 5 (kg)	Total Mass, Lower Range (kg)	Total Mass, Upper Range (kg)	Mass Removed (50%), Lower and Upper Ranges (kg)	Mass Removed (75%), Lower and Upper Ranges (kg)	Mass Removed (90%), Lower and Upper Ranges (kg)			
Benzene	34	213	274	264	306	1,092	364	3,275	182	1,637	273	2,456	327	2,947
Chlorobenzene	269	790	2,057	3,040	4,074	10,229	3,410	30,688	1,705	15,344	2,557	23,016	3,069	27,619
1,4-Dichlorobenzene	264	1,903	42,504	30,645	91	75,407	25,136	226,220	12,568	113,110	18,852	169,665	22,622	203,598
1,2-Dichlorobenzene	264	191	325	1,834	33	2,646	882	7,939	441	3,969	662	5,954	794	7,145
1,3-Dichlorobenzene	497	80	317	448	33	1,375	458	4,126	229	2,063	344	3,094	413	3,713
1,2,4-Trichlorobenzene	41,939	1,686	33,524	2,498	28	79,674	26,558	239,023	13,279	119,512	19,919	179,267	23,902	215,121
Hexachlorobenzene	12,499	1,735	23,830	15,942	33	54,038	18,013	162,114	NA	NA	NA	NA	NA	NA

Notes:

- 1) Calculated mass for each block is based on average concentration in the MHU and DHU, block area, thickness, and bulk density.
- 2) Lower range for total mass based on calculated mass divided by three. Upper range for total mass based on calculated mass multiplied by three.
- 3) Masses removed (lower and upper ranges) are based on calculated ranges and the assumed mass removal percentages.
- 4) Pulsed air biosparging is the conceptual technology for source mass reduction in Alternative 5 of the Sauget Area 1 FS.
- 5) NA = not applicable. Hexachlorobenzene is not susceptible to aerobic biodegradation.

Table I-1

Calculated Mass Ranges and Potential Mass Removal from Residual DNAPL Areas

Feasibility Study, Sauget Area 1, Sauget and Cahokia, Illinois

BORING ID:	A1-02														Average Concentration in MHU and DHU	Calculated Mass in Block 2 (A1-02) (kg)
	DEPTH INTERVAL:	7.5-10 ft	12.5-15 ft	22.5-25 ft	32.5-35 ft	47.5-50 ft	50-52.5 ft	62.5-65 ft	75-77.5 ft	75-77.5 ft	82.5-85 ft	82.5-85 ft	90-92.5 ft	105-107 ft		
SAMPLE TYPE:	N	N	N	N	N	N	N	N	N	Dup	N	Dup	N	N		
SAMPLE DATE:	9/11/04	9/11/04	9/11/04	9/11/04	9/11/04	9/11/04	9/11/04	9/11/04	9/12/04	9/12/04	9/12/04	9/12/04	9/12/04	9/12/04		
PARAMETER	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg		
Benzene	10J	58	0.16J	0.028J	<0.29	0.24J	<7	<0.2	<0.22	<0.18	<0.19	<0.12	<0.17	0.53	213	
Chlorobenzene	650	120	0.81	0.56	0.42	11	<7	<0.2	<0.22	0.07J	0.08J	<0.12	<0.17	1.98	790	
1,4-Dichlorobenzene	590	710	3.3	<0.41	0.28J	32	3.3	0.12J	0.095J	2.2	1.7	<0.4	0.037J	4.76	1,903	
1,2-Dichlorobenzene	110	210	0.88	<0.41	0.033J	2.6	<0.38	<0.4	<0.4	<0.4	<0.4	<0.4	<0.39	0.48	191	
1,3-Dichlorobenzene	<24	<47	<0.43	<0.41	<0.42	<0.42	<0.38	<0.4	<0.4	<0.4	<0.4	<0.4	<0.39	0.20	80	
1,2,4-Trichlorobenzene	82	200	0.096J	<0.41	<0.42	19	8.3	0.12J	0.14J	5.9	5.1	<0.4	<0.39	4.22	1,686	
Hexachlorobenzene	64	14J	<0.43	<0.41	<0.42	14	19	0.76	0.86	0.27J	0.21J	0.058J	<0.39	4.34	1,735	

Notes:

- 1) Average concentration for MHU and DHU was determined based on average of all samples from depths > 30 ft bgs. Duplicate samples were averaged. Where result was non-detect, half the detection limit was used.
- 2) The average concentration at the boring was assumed to be representative of the concentration in the surrounding block of aquifer matrix identified on Figure I-1
- 3) Calculated mass for each block is based on average concentration in the MHU and DHU, block area, thickness, and bulk density.
- 4) Values for block area, aquifer thickness (MHU + DHU), and bulk density are as follows:

Residual DNAPL area (sq. ft)	103,800 (Block 2 on Figure I-1)
Aquifer thickness, MHU + DHU (ft)	80
Bulk density (g/mL)	1.7

Table I-1

Calculated Mass Ranges and Potential Mass Removal from Residual DNAPL Areas

Feasibility Study, Sauget Area 1, Sauget and Cahokia, Illinois

BORING ID:	A1-08												Average Concentration in MHU and DHU	Calculated Mass in Block 4 (A1-08) (kg)
	DEPTH INTERVAL:	5-7.5 ft	10-12.5 ft	22.5-25 ft	30-32.5 ft	47.5-50 ft	47.5-50 ft Dup	57.5-60 ft	60-62.5 ft	70-72.5 ft	82.5-85 ft	90-92.5 ft		
SAMPLE TYPE:	N	N	N	N	N	Dup	N	N	N	N	N	N	N	
SAMPLE DATE:	9/22/04	9/22/04	9/22/04	9/22/04	9/22/04	9/22/04	9/22/04	9/22/04	9/22/04	9/22/04	9/22/04	9/22/04	9/22/04	
PARAMETER	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Benzene	3.5J	6	22	2.2	0.31J	0.41J	<5.3	<0.96	<4.9	<0.28	<1.3	<0.98	1.18	264
Chlorobenzene	910	560	100	20	44	56	4.7J	23	6.6	1.3J	1.5	1.4	13.56	3,040
1,4-Dichlorobenzene	8.8	54	1400	3.8	73	230	14	9.4	670	240	4.9	0.2J	136.73	30,645
1,2-Dichlorobenzene	7.7	13	760J	0.3J	<2.4	19	0.61J	0.35J	42	9.9	<2.3	<2.1	8.18	1,834
1,3-Dichlorobenzene	<2.3	<2.6	<32	<2.4	<2.4	<2.4	<2.5	<2.5	7.7	<2.4	<2.3	<2.1	2	448
1,2,4-Trichlorobenzene	16	120	23000	7.5	9.3	16	6	0.75J	36	24	1.2J	<2.1	11.14	2,498
Hexachlorobenzene	<2.3	6.2	2200	54	120	140	32	37	190	85	14	27	71.13	15,942

Notes:

- 1) Average concentration for MHU and DHU was determined based on average of all samples from depths > 30 ft bgs. Duplicate samples were averaged. Where result was non-detect, half the detection limit was used.
- 2) The average concentration at the boring was assumed to be representative of the concentration in the surrounding block of aquifer matrix identified on Figure I-1
- 3) Calculated mass for each block is based on average concentration in the MHU and DHU, block area, thickness, and bulk density.
- 4) Values for block area, aquifer thickness (MHU + DHU), and bulk density are as follows:

Residual DNAPL area (sq. ft)	58,200 (Block 4 on Figure I-1)
Aquifer thickness (ft)	80
Bulk density (g/mL)	1.7

Table I-1

Calculated Mass Ranges and Potential Mass Removal from Residual DNAPL Areas

Feasibility Study, Sauget Area 1, Sauget and Cahokia, Illinois

BORING ID:	A1-09													Average Concentration in MHU and DHU	Calculated Mass in Block 5 (A1-09) (kg)
	5-7.5 ft	17.5-20 ft	25-27.5 ft	25-27.5 ft Dup	32.5-35 ft	42.5-45 ft	57.5-60 ft	65-67.5 ft	65-67.5 ft Dup	77.5-80 ft	82.5-85 ft	92.5-95 ft	105-107.5 ft		
DEPTH INTERVAL:	N	N	N	Dup	N	N	N	N	Dup	N	N	N	N		
SAMPLE TYPE:	N	N	N	Dup	N	N	N	N	Dup	N	N	N	N		
SAMPLE DATE:	9/29/04	9/29/04	9/29/04	9/29/04	9/29/04	9/29/04	9/29/04	9/29/04	9/29/04	9/29/04	9/29/04	9/29/04	9/29/04		
PARAMETER	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	
Benzene	0.0063	<0.0069	0.94J	1.3J	<27	<1.2	<0.24	<0.2	<0.51	<0.48	<0.21	<0.17	<0.19	1.87	306
Chlorobenzene	0.014	0.03	13	8.6	170	18J	2.7	1.5	3.9	2.5J	1.4J	0.25J	1.1	24.83	4,074
1,4-Dichlorobenzene	<0.38	<0.44	0.53	0.58	0.2J	<0.36	<0.41		0.033J	0.097J	0.049J	0.88	2.8	0.56	91
1,2-Dichlorobenzene	<0.38	<0.44	0.48	0.63	<0.42	<0.36	<0.41		<0.4	<0.4	<0.41	<0.37	<0.4	0.20	33
1,3-Dichlorobenzene	<0.38	<0.44	<0.42	<0.43	<0.42	<0.36	<0.41		<0.4	<0.4	<0.41	<0.37	<0.4	0.20	33
1,2,4-Trichlorobenzene	<0.38	<0.44	9.2	13	0.083J	<0.36	<0.41		<0.4	<0.4	<0.41	<0.37	0.11J	0.17	28
Hexachlorobenzene	<0.38	<0.44	1.1	1.1	<0.42	<0.36	<0.41		<0.4	<0.4	<0.41	<0.37	<0.4	0.20	33

Notes:

- 1) Average concentration for MHU and DHU was determined based on average of all samples from depths > 30 ft bgs. Duplicate samples were averaged. Where result was non-detect, half the detection limit was used.
- 2) The average concentration at the boring was assumed to be representative of the concentration in the surrounding block of aquifer matrix identified on Figure I-1
- 3) Calculated mass for each block is based on average concentration in the MHU and DHU, block area, thickness, and bulk density.
- 4) Values for block area, aquifer thickness (MHU + DHU), and bulk density are as follows:

Residual DNAPL area (sq. ft)	42,600 (Block 5 on Figure I-1)
Aquifer thickness (ft)	80
Bulk density (g/mL)	1.7

Table I-1

Calculated Mass Ranges and Potential Mass Removal from Residual DNAPL Areas

Feasibility Study, Sauget Area 1, Sauget and Cahokia, Illinois

BORING ID:	A1-14														Average Concentration in MHU and DHU	Calculated Mass in Block 1 (A1-14) (kg)
	DEPTH INTERVAL:	2.5-5 ft	12.5-15 ft	25-27.5 ft	37.5-40 ft	37.5-40 ft	45-47.5 ft	57.5-60 ft	60-62.5 ft	72.5-75 ft	85-87.5 ft	92.5-95 ft	102.5-105 ft	102.5-105 ft		
SAMPLE TYPE:	N	N	N	N	Dup	N	N	N	N	N	N	N	Dup	N		
SAMPLE DATE:	10/11/04	10/11/04	10/11/04	10/11/04	10/11/04	10/11/04	10/11/04	10/11/04	10/11/04	10/11/04	10/11/04	10/11/04	10/11/04	10/11/04		
PARAMETER	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	
Benzene	0.88J	8.8	7.2	0.19J	0.27J	<0.98	<0.49	<0.18	<0.22	<0.11	<0.5	<0.48	<0.47	<0.45	0.21	34
Chlorobenzene	4.3	2.5J	8.6	10	12	0.93J	0.63	0.64	<0.22	0.3	<0.5	<0.48	<0.47	0.99	1.68	269
1,4-Dichlorobenzene	0.33J	<43	19	<4	1.9J	<3.5	<3.6	<3.7	<0.39	<3.5	<4	<3.5	<3.5	<3.5	1.64	264
1,2-Dichlorobenzene	<4.1	<43	<4.1	<4	<3.8	<3.5	<3.6	<3.7	<0.39	<3.5	<4	<3.5	<3.5	<3.5	1.64	264
1,3-Dichlorobenzene	<4.1	<43	<4.1	3J	<3.8	1.2J	1.2J	<3.7	0.086J	<3.5	3.2J	<3.5	0.49J	15	3.10	497
1,2,4-Trichlorobenzene	1.3J	57	990	380	290	24	4.4	<3.7	0.14J	21	94	230	310	1600	261.15	41,939
Hexachlorobenzene	<4.1	<43	160	120	76	28	28	2.5J	3	66	120	130	140	220	77.83	12,499

Notes:

- 1) Average concentration for MHU and DHU was determined based on average of all samples from depths > 30 ft bgs. Duplicate samples were averaged. Where result was non-detect, half the detection limit was used.
- 2) The average concentration at the boring was assumed to be representative of the concentration in the surrounding block of aquifer matrix identified on Figure I-1
- 3) Calculated mass for each block is based on average concentration in the MHU and DHU, block area, thickness, and bulk density.
- 4) Values for block area, aquifer thickness (MHU + DHU), and bulk density are as follows:

Residual DNAPL area (sq. ft) 41,700 (Block 1 on Figure I-1)
 Aquifer thickness (ft) 80
 Bulk density (g/mL) 1.7

Table I-1

Calculated Mass Ranges and Potential Mass Removal from Residual DNAPL Areas

Feasibility Study, Sauget Area 1, Sauget and Cahokia, Illinois

BORING ID:	A1-19												Average Concentration in MHU and DHU	Calculated Mass in Block 3 (A1-19) (kg)
	DEPTH INTERVAL:	6-8.5 ft	11-13.5 ft	28.5-31 ft	28.5-31 ft	33.5-36 ft	42.5-45 ft	58.5-60 ft	66.5-68 ft	76-78.5 ft	88-90.5 ft	93.5-96 ft		
SAMPLE TYPE:	N	N	N	Dup	N	N	N	N	N	N	N	N	N	
SAMPLE DATE:	10/12/05	10/12/05	10/12/05	10/12/05	10/12/05	10/12/05	10/12/05	10/13/05	10/13/05	10/13/05	10/13/05	10/13/05	10/13/05	
PARAMETER	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	
Benzene	18	26	1.3	0.18J	<3.5	<0.39	<0.14	<1	<0.65	<0.43	<4.3	<0.44	0.68	274
Chlorobenzene	880	990	16J	3.4J	14J	5.4	3.5	7.3	4.2	3.3	<3.5	1.2J	5.08	2,057
1,4-Dichlorobenzene	130	93	270	22	2.5J	5.3	4.7	9.4	4.2	14	240	560	105.01	42,504
1,2-Dichlorobenzene	26J	17	<0.54	0.83J	<0.54	0.37J	0.31J	<0.27	<0.27	0.3J	3.5J	<2.8	0.80	325
1,3-Dichlorobenzene	8J	3.1J	<0.61	<0.58	<0.61	<0.3	<0.29	<0.31	<0.31	<0.31	1.8J	3.4J	0.78	317
1,2,4-Trichlorobenzene	56	31	16	57	17	6.9	55	12	3.8J	5.9	42	520	82.83	33,524
Hexachlorobenzene	<3.6	<0.7	77	50	14	41	30	35	12	39	120	180	58.88	23,830

Notes:

- 1) Average concentration for MHU and DHU was determined based on average of all samples from depths > 30 ft bgs. Duplicate samples were averaged. Where result was non-detect, half the detection limit was used.
- 2) The average concentration at the boring was assumed to be representative of the concentration in the surrounding block of aquifer matrix identified on Figure I-1
- 3) Calculated mass for each block is based on average concentration in the MHU and DHU, block area, thickness, and bulk density.
- 4) Values for block area, aquifer thickness (MHU + DHU), and bulk density are as follows:

Residual DNAPL area (sq. ft)	105,100 (Block 3 on Figure I-1)
Aquifer thickness (ft)	80
Bulk density (g/mL)	1.7